Water content of 1997 vulcanian pumices at Soufriere Hills Volcano (Montserrat) and implications on pre-eruptive conduit conditions

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Abstract

A series of 88 Vulcanian explosions occurred at Soufriere Hills Volcano (Montserrat) between August and October 1997. Conduit conditions prior to each explosion have been explored by analysing representative textures of the eruptive products. We used quantitative analysis of water content in residual glasses (matrix glass) in order to constrain the sampling depth of these ejecta. Studied textures cover the natural range of Vulcanian products and include homogeneous fallout pumices, glassy blocks, banded rocks and dome samples. To better link water content to structural level, we performed new water solubility experiments at low pressure (less than 750 bars) and high temperature (850-1050°C) in internally heated pressure vessel on synthetic rhyolitic glass of the same composition than the natural matrix glass.

Water contents in natural products have been measured by Karl-Fischer Titration (an accurate electrochemical technique) on whole-rock and have been corrected using the crystallinity of the samples. Water contents in experimental glasses have been measured by Karl-Fischer Titration and by Fourier Transform Infrared technique (FTIR).

Preliminary results indicate that most Vulcanian products have residual glass water content higher than 1 wt % and that only glassy blocks have lower water content. This suggests that the water content is closely correlated to the textural characteristics of each sample. We will discuss a more general model for Vulcanian explosion based on the integration of our data on natural products with the new water solubility experiments.

Figure 1: Ash eruption of Soufrière Hills (Montserrat) from Nord-East.